



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

## NOTICE OF ALLOWANCE AND FEE(S) DUE

45209 7590 02/22/2010

INTEL/BSTZ  
BLAKELY SOKOLOFF TAYLOR & ZAFMAN LLP  
1279 OAKMEAD PARKWAY  
SUNNYVALE, CA 94085-4040

EXAMINER

NAHAR, QAMRUN

ART UNIT

PAPER NUMBER

2191

DATE MAILED: 02/22/2010

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/582,519

06/09/2006

Long Li

42P21666

1002

TITLE OF INVENTION: SPECULATIVE CODE MOTION FOR MEMORY LATENCY HIDING

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	\$1510	\$300	\$0	\$1810	05/24/2010

**THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.**

**THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.**

### HOW TO REPLY TO THIS NOTICE:

#### I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

**IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.**

# **PART B - FEE(S) TRANSMITTAL**

**Complete and send this form, together with applicable fee(s), to: Mail Mail Stop ISSUE FEE  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
or Fax (571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

45209 7590 02/22/2010

**INTEL/BSTZ**  
**BLAKELY SOKOLOFF TAYLOR & ZAFMAN LLP**  
**1279 OAKMEAD PARKWAY**  
**SUNNYVALE, CA 94085-4040**

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

## **Certificate of Mailing or Transmission**

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/582,519 06/09/2006 Long Li 42P21666 1002

TITLE OF INVENTION: SPECULATIVE CODE MOTION FOR MEMORY LATENCY HIDING

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
-------------	--------------	---------------	---------------------	----------------------	------------------	----------

nonprovisional NO \$1510 \$300 \$0 \$1810 05/24/2010

EXAMINER	ART UNIT	CLASS-SUBCLASS
----------	----------	----------------

NAHAR, QAMRUN 2191 717-161000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

- (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, 1 \_\_\_\_\_
- (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. 2 \_\_\_\_\_
- 3 \_\_\_\_\_

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

- ☐ Issue Fee
- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies \_\_\_\_\_

4b. Payment of Fee(s); (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.
- ☐ Payment by credit card. Form PTO-2038 is attached.
- ☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number \_\_\_\_\_ (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27. ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature \_\_\_\_\_

Date \_\_\_\_\_

Typed or printed name \_\_\_\_\_

Registration No. \_\_\_\_\_

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/582,519

06/09/2006

Long Li

42P21666

1002

45209

7590

02/22/2010

EXAMINER

NAHAR, QAMRUN

ART UNIT

PAPER NUMBER

2191

DATE MAILED: 02/22/2010

INTEL/BSTZ

BLAKELY SOKOLOFF TAYLOR & ZAFMAN LLP  
1279 OAKMEAD PARKWAY  
SUNNYVALE, CA 94085-4040

## Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)

(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 788 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 788 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

<b>Notice of Allowability</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/582,519	LI ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	QAMRUN NAHAR	2191	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the amendment filed on 01/04/2010.
2. ☒ The allowed claim(s) is/are 1-13 and 16-27, renumbered 1-25.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☒ All    b) ☐ Some\*    c) ☐ None    of the:
    1. ☒ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
  - \* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
  - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
    - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
  - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.

**Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).**
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

- |  |  |
|--|--|
| 1. <input type="checkbox"/> Notice of References Cited (PTO-892)   | 5. <input type="checkbox"/> Notice of Informal Patent Application                      |
| 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 6. <input type="checkbox"/> Interview Summary (PTO-413),<br>Paper No./Mail Date _____. |
| 3. <input type="checkbox"/> Information Disclosure Statements (PTO/SB/08),<br>Paper No./Mail Date _____    | 7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment                    |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br>of Biological Material | 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance   |
|  | 9. <input type="checkbox"/> Other _____.   |

Art Unit: 2191

### **DETAILED ACTION**

1. This action is in response to the amendment filed on 01/04/2010.
2. The objection to the specification is withdrawn in view of applicant's remarks/arguments.
3. The objection to claim 22 is withdrawn in view of applicant's amendment.
4. The rejection under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter to claims 22-28 is withdrawn in view of applicant's amendment.
5. The rejection under 35 U.S.C. 102(b) as being anticipated by Chang, et al. "Impact: An Architectural Framework for Multiple-Instruction-Issue Processors", 1991 (hereinafter "Chang") to claims 1-28 is withdrawn in view of applicant's amendment and remarks/arguments.
6. Claims 1, 8, 13, 16-20 and 22-27 have been amended.
7. Claims 14-15 and 28 have been canceled.
8. Claims 1-13 and 16-27 are pending.
9. Claims 1-13 and 16-27 are allowed, renumbered 1-25.

### **EXAMINER'S AMENDMENT**

10. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Gregory D. Caldwell (Reg. No. 39,926) on 2/1/10.

Art Unit: 2191

The application has been amended as follows:

**In the Claims:**

Please amend claims 8, 13 and 22-27 as follows:

**Claim 8 (Currently Amended),**

In line 3, before “except” insert in the program

In line 4, after “constraint of”, delete [a] and insert the

In line 6, after “instructions” insert in the program

In line 7, after “constraint of”, delete [a] and insert the

**Claim 13 (Currently Amended),**

In line 1, before “compiler”, delete [A] and insert A computer system, comprising: a processor, a

In line 2, before “memory”, delete [a] and insert each

In line 4, before “asynchronous”, delete [the] and insert each

In line 5, after “first code motion” insert on a first set of one or more instructions

In line 5, after “except”, delete [the] and insert each

In line 6, after “instruction” insert in the program

In line 7, after “code motion” insert on a second set of one or more instructions

In line 7, after “except”, delete [the] and insert each

In line 7, before “subject” insert in the program

Art Unit: 2191

In line 8, before “memory” delete [a] and insert the

In line 9, after “program” insert and to increase a number of instructions between issue and completion of the memory access instruction

**Claim 22 (Currently Amended),**

In line 1, before “medium” insert storage

In line 2, after "device", delete [determining a sinking candidate from one or more instructions of the program except a memory access instruction in the program, based on a dependence constraint of the program; performing a code sinking on each instruction corresponding to the sinking candidate subject to the dependence constraint; determining a hoisting candidate from one or more instructions of the program except a wait instruction associated with the memory access instruction, based on the dependence constraint; and performing a code hoisting on each instruction corresponding to the hoisting candidate subject to the dependence constraint] and insert extracting an asynchronous signal from each memory access instruction in a program to represent a latency of the memory access instruction;

generating a wait instruction to wait for each asynchronous signal;

performing a first code motion on a first set of one or more instructions in the program except each memory access instruction in the program subject to a dependence constraint of the program; and

performing a second code motion on a second set of one or more instructions in the program except each wait instruction in the program subject to a dependence constraint of the program, to increase a number of instructions between issue and completion of the memory

Art Unit: 2191

access instruction, wherein the first code motion and the second code motion are in opposite directions

**Claim 23 (Currently Amended),**

In line 1, before “medium” insert storage

In line 2, before “medium” insert storage

In line 3, after “device”, delete [in response to determining that a number of occurrence of the code motion candidate in the predecessor blocks is smaller than a number of predecessor blocks and in response to determining that the candidate is a wait instruction, appending a compensation code to one or more of the predecessor blocks where the code motion candidate is absent] and insert enforcing a first dependence between the memory access instruction and the wait instruction via the asynchronous signal

**Claim 24 (Currently Amended),**

In line 1, before “medium” insert storage

In line 1, after “claim”, delete [23] and insert 22

In line 2, before “medium” insert storage

In line 3, after “device”, delete [appending a wait instruction corresponding to the code motion candidate to each of said one or more predecessor blocks where the code motion candidate is absent] and insert introducing a pseudo signal to enforce a second dependence between the wait instruction and a memory access dependent instruction



Art Unit: 2191

**Claim 25 (Currently Amended),**

In line 1, before “medium” insert storage

In line 1, after “claim”, delete [24] and insert 22

In line 2, before “medium” insert storage

In line 3, after “device”, delete [sinking each wait instruction corresponding to the code motion candidate in each predecessor blocks of the first block into the first block] and insert making the memory access instruction define the asynchronous signal; and making the wait instruction use the asynchronous signal

**Claim 26 (Currently Amended),**

In line 1, before “medium” insert storage

In line 2, before “medium” insert storage

In line 3, after “device”, delete [in response to determining that a number of occurrence of the code motion candidate in the predecessor blocks equals to a number of the predecessor blocks, removing each instruction corresponding to the code motion candidate from each predecessor block of the first block; and prepending an instruction instance of the code motion candidate to the first block] and insert making the wait instruction define a pseudo signal; and making an instruction that depends on the completion of the memory access instruction use the pseudo signal

**Claim 27 (Currently Amended),**

In line 1, before “medium” insert storage

Art Unit: 2191

In line 1, after “claim”, delete [26] and insert 22

In line 2, before “medium” insert storage

In line 3, after “device”, delete [updating a dependent constraint of predecessor blocks of the first block] and insert storing the asynchronous signal in a signal register of a network device

- END -

### **REASONS FOR ALLOWANCE**

11. The following is an examiner’s statement of reasons for allowance:

The cited prior art taken alone or in combination fail to teach, in combination with the other claimed limitations, performing a first code motion on a first set of one or more instructions in the program except each memory access instruction in the program subject to a dependence constraint of the program; and performing a second code motion on a second set of one or more instructions in the program except each wait instruction in the program subject to a dependence constraint of the program, to increase a number of instructions between issue and completion of the memory access instruction, wherein the first code motion and the second code motion are in opposite directions as recited in independent claims 1, 8, 13, and 22.

The closest cited prior art, Chang teaches a method of scheduling code based on dependence constraint of a program. However, Chang fails to teach performing a first code motion on a first set of one or more instructions in the program except each memory access instruction in the program subject to a dependence constraint of the program; and performing a second code motion on a second set of one or more instructions in the program except each wait

Art Unit: 2191

instruction in the program subject to a dependence constraint of the program, to increase a number of instructions between issue and completion of the memory access instruction, wherein the first code motion and the second code motion are in opposite directions as recited in independent claims 1, 8, 13, and 22; and as pointed out by the applicant's remarks/arguments on pg. 14, par. 1 to pg. 15, par. 2.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

### ***Conclusion***

12. Any inquiry concerning this communication from the examiner should be directed to Qamrun Nahar whose telephone number is (571) 272-3730. The examiner can normally be reached on Mondays through Fridays from 10:00 AM to 6:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wei Y Zhen, can be reached on (571) 272-3708. The fax phone number for the organization where this application or processing is assigned is (571) 273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the TC 2100 Group receptionist whose telephone number is 571-272-2100.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

Art Unit: 2191

applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Qamrun Nahar/

Qamrun Nahar

Art Unit 2191

/Wei Y Zhen/

Supervisory Patent Examiner, Art Unit 2191